

WHAT IS CLAIMED IS:

1. A humidifying cylinder, comprising:

a first rotatable cylinder having an inlet end and an outlet end and a plurality of first blades extending substantially radially outwardly from an exterior surface of the first cylinder;

a second rotatable cylinder having an inlet end and an outlet end and a plurality of second blades extending substantially radially inwardly from an interior surface of the second cylinder, the second cylinder being substantially coaxial with the first cylinder and the first cylinder being disposed inside of the second cylinder such that the exterior surface of the first cylinder and the interior surface of the second cylinder define an annular space;

at least one drive for rotating the first cylinder and the second cylinder; and

at least one conduit disposed in the annular space for introducing moisture into the annular space.

2. The humidifying cylinder as set forth in claim 1, wherein the at least one conduit includes openings for introducing moisture at different locations in the annular space.

3. The humidifying cylinder as set forth in claim 2, wherein the at least one conduit permits introduction of different amounts of moisture at the different locations in the annular space.

4. The humidifying cylinder as set forth in claim 1, wherein the at least one conduit includes nozzles for introducing moisture as atomized droplets.

5 5. The humidifying cylinder as set forth in claim 1, wherein the at least one drive includes a single motor arranged to drive both the first cylinder and the second cylinder.

6. The humidifying cylinder as set forth in claim 5, wherein the at least one drive is arranged to drive the first cylinder and the second cylinder in a same direction of rotation.

10 7. The humidifying cylinder as set forth in claim 1, wherein the at least one drive is arranged to drive the first cylinder and the second cylinder in a same direction of rotation.

8. The humidifying cylinder as set forth in claim 1, wherein the at least one drive includes a first drive for driving the first cylinder and a second drive for driving the second cylinder.

15 9. The humidifying cylinder as set forth in claim 8, wherein the at least one drive is arranged to drive the first cylinder and the second cylinder in a same direction of rotation.

10. The humidifying cylinder as set forth in claim 1, wherein the inlet end of the first cylinder and the inlet end of the second cylinder are disposed vertically above the outlet end of the first cylinder and the outlet end of the second cylinder, respectively.

5 11. The humidifying cylinder as set forth in claim 1, wherein the first cylinder, the first blades, the second cylinder, and the second blades are sized such that, when the first cylinder and the second cylinder are rotated, material falls from second blades onto the first cylinder and then falls from first blades onto the second cylinder.

10 12. A method of humidifying material, comprising the steps of:
introducing material into an annular space between a first rotatable cylinder having an inlet end and an outlet end and a plurality of first blades extending substantially radially outwardly from an exterior surface of the first cylinder and a second rotatable cylinder having an inlet end and an outlet end and a plurality of
15 second blades extending substantially radially inwardly from an interior surface of the second cylinder, the second cylinder being substantially coaxial with the first cylinder and the first cylinder being disposed inside of the second cylinder such that the exterior surface of the first cylinder and the interior surface of the second cylinder define the annular space;

rotating the first cylinder and the second cylinder such that, as the second cylinder is rotated, material falls from at least some of the second blades onto the first cylinder and, as the first cylinder rotates, material falls from at least some of the first blades onto the second cylinder;

5 conveying material in the annular space from the inlet end of the first cylinder and the inlet end of the second cylinder toward the outlet end of the first cylinder and the outlet end of the second cylinder; and

applying moisture to material in the annular space.

10 13. The method as set forth in claim 12, wherein different amounts of moisture are applied to the material at different locations in the annular space.

14. The method as set forth in claim 12, wherein moisture is applied to the material in the annular space as atomized droplets.

15. The method as set forth in claim 12, wherein the first cylinder and the second cylinder are rotated by a common drive.

15 16. The method as set forth in claim 15, wherein the first cylinder and the second cylinder are rotated in a same direction.

17. The method as set forth in claim 12, wherein the first cylinder is rotated by a first drive and the second cylinder is rotated by a second drive.

18. The method as set forth in claim 17, wherein the first cylinder and the second cylinder are rotated in a same direction.

5 19. The method as set forth in claim 12, wherein the first cylinder and the second cylinder are rotated at a same rotational speed.

20. The method as set forth in claim 12, wherein material is conveyed in the annular space from the inlet end of the first cylinder and the inlet end of the second cylinder toward the outlet end of the first cylinder and the outlet end of the
10 second cylinder by gravity.